



# Forest Health *highlights*

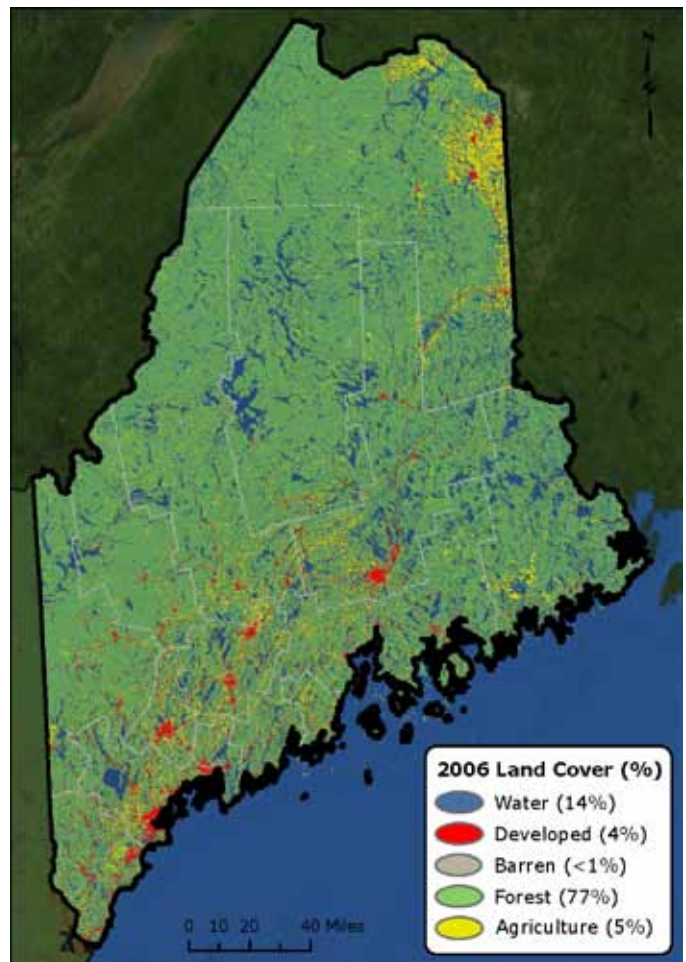
MAINE



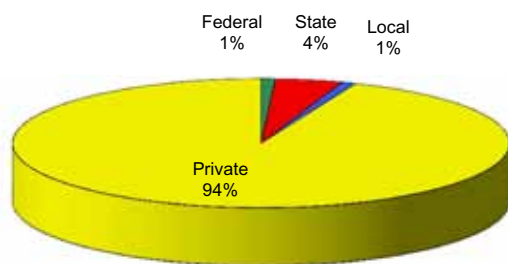
## Forest Resource Summary

Almost all of the forest lands in Maine are privately owned—approximately 94 percent—with only 1 percent in Federal ownership that encompasses the eastern portion of the White Mountain National Forest. The latest Maine forest inventory estimates that there are approximately 17.7 million acres in the State that are forested. The forest resource is made up of a variety of forest types, mostly spruce and balsam fir, maples, other hardwoods, and pine.

Maine's forests provide much of the raw materials to fuel the State's mills and serve as the backdrop for the recreation industry. These forest-based industries employ more than 12 percent of Maine's workforce and generate more than 11 percent of the State's payroll. The overall annual contribution of the forest resource to Maine's economy exceeds \$8.5 billion. The forests of the State also



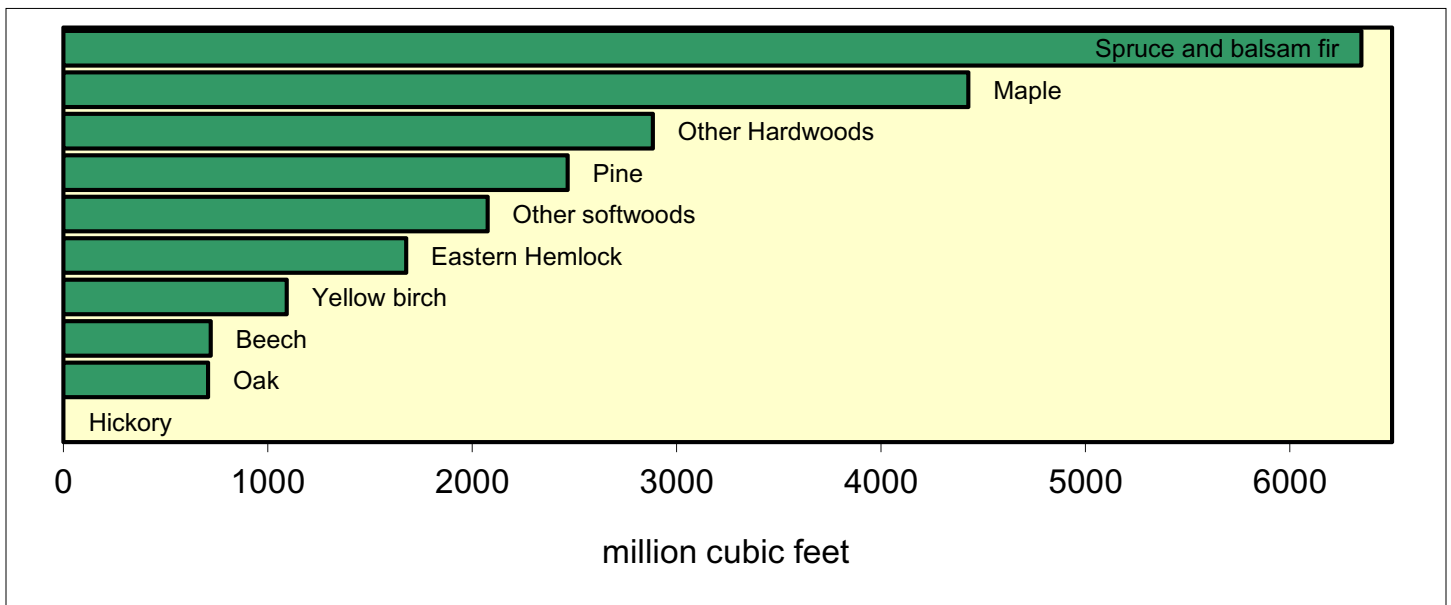
Forest Land Ownership



## Forest Health Programs in the Northeast

State forestry agencies work in partnership with the U.S. Forest Service to monitor forest conditions and trends in their State and respond to pest outbreaks to protect the forest resource.

## Forest Species Type

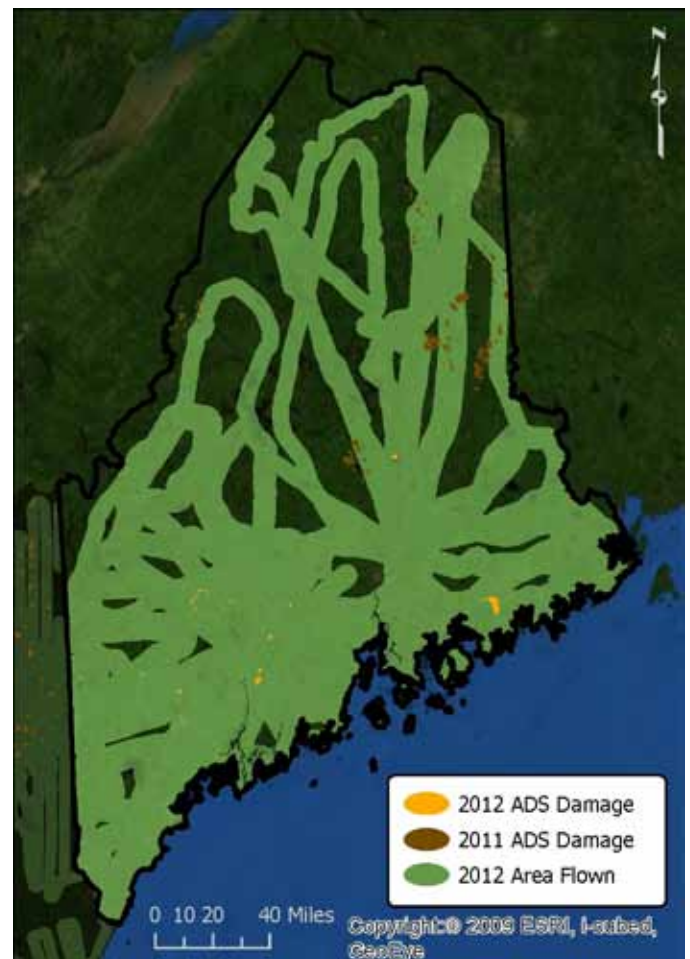


provide watershed, environmental, wildlife, and recreational benefits. Forested parks and individual shade trees provide similar amenities in urban and suburban settings.

## Aerial Surveys

In Maine there were over 12,000 acres of damage mapped, mostly from defoliation attributed to various insect pests including browntail moth, Bruce spanworm, fall cankerworm, and the introduced winter moth.

*This map delineates aerial detection survey (ADS) results for Maine in 2012 and 2011.*



## Forest Health Highlights

Statewide in Maine, the winter of 2011–2012 (December to February) was the fourth warmest on record over 117 years of recordkeeping (<http://www.nrcc.cornell.edu/>). This and anomalous spring weather conditions set Maine forest insects and diseases up for an interesting year. Despite indications of building populations of lepidopterous defoliators, few significant defoliation events were mapped in aerial survey or caught in ground survey and client reports. Some exceptions are noted below. In April it appeared we might be in for a warm, dry spring and with it a promise of relief from foliar and needle diseases, replaced by the specter of drought stress. Moisture levels did rebound and although foliar diseases were not as bad as in previous years, they were noticeable and resulted in many reports from the public.

## Disease Highlights

A regional survey for **hemlock tip blight** caused by the fungus *Sirococcus tsugae* was initiated in cooperation with U.S. Forest Service personnel (figure 1). Sample stands in Maine were selected from FIA plots known to include eastern hemlock (*Tsuga canadensis*) that are located on public lands. To date, the survey has examined 22 plots for hemlock tip blight presence and severity. A total of 20 hemlock trees were rated for disease incidence and severity at each location. Damaged shoots typical of hemlock tip blight were found at all but one plot location (plot 213 Benton). To date, the fungus has been confirmed using molecular techniques from five counties—Aroostook, Cumberland, Hancock, Penobscot, and York. It has also been confirmed based on spore analysis from Oxford and Piscataquis Counties. The work will be continuing through 2013, but has so far shown the disease to be a common pathogen on hemlock throughout Maine. It appears to be causing significant damage to hemlock regeneration in several locations, primarily in southern Maine.



Figure 1.—Hemlock tip blight (*Sirococcus tsugae*) affecting new shoot growth in Cape Elizabeth, ME (July 12, 2012).

***Sirococcus* shoot blight** (*Sirococcus conigenus*) is becoming one of the most significant disease threats to commercial forest production in Maine. After the spruce budworm epidemic of the late 1970s and early 1980s, thousands of acres of red pine (*Pinus resinosa*) plantations were established on forest lands that had been harvested during pre-salvage and salvage operations. Many of these plantations occur in the Downeast region of Washington and Hancock Counties, and in the central Maine region of southern Franklin and Somerset Counties. Many additional plantations exist in eastern Aroostook County, as well.

With a new finding of significant mortality in a red pine plantation in Mayfield Township (Somerset County), Maine appears to be at the forefront of significant disease losses in these immature plantations (figure 2). The disease is widespread in the State, with infection levels largely determined by weather factors of high moisture and an ample supply of susceptible species. Management of a more widespread epidemic, should one develop, will likely prove difficult and costly. Trees in many plantations nearby and elsewhere in the State are also infected, but with significant damage not yet realized.





Figure 2.—*Sirococcus conigenus* infection resulting in red pine mortality in Mayfield Township, ME (September 27, 2012).

An unusual occurrence of **needle drop** on eastern hemlock was observed and reported throughout southern, eastern, and central Maine during mid-June to around mid-July. The needles, which appear green and healthy, were shed in numbers high enough so as to cover the ground and leaves of understory vegetation in an almost complete layer (figure 3). Both current-year needles and older needles were affected, with the proportion apparently varying from site to site. The cause of the needle loss is unknown, but neither pathogens nor insects appear to be involved. Physiological changes due to an unusual combination of weather conditions may be responsible, but no strong associations have been made. The needle loss seemed to abate as quickly as it was initiated, with no significant needle loss occurring after late July.



Figure 3.—Hemlock needles prematurely shed from trees litter the forest floor during June and early July, 2012, in Batchelders Grant Township, ME.

**White pine needle diseases** have been of concern on eastern white pine (*Pinus strobus*) in recent years. There was noticeably less early needle browning and needle loss of white pines in Maine this season than over the past several years. The three principal pathogens responsible for the needle losses identified to date (*Mycosphaerella dearnessii*, *Canavirgella banfieldii*, and *Bifusella linearis*) appear to be distributed statewide wherever the host occurs, but *M. dearnessii* is most prevalent (figure 4). The heaviest infections were observed on white pines in the southern and western regions of the State. Heaviest needle losses this year were observed in the Towns of Shapleigh and Newfield (York County) and Standish (Cumberland County). Moderate defoliation has been reported or observed from New Limerick (Aroostook County), Brunswick (Cumberland County), Wells (York County), Lovell and Bethel (Oxford County), Belgrade (Kennebec County), and Industry (Franklin County).

As part of a multistate effort to monitor the occurrence and severity of the needle diseases, several study plots have been established in Maine in cooperation with the U.S. Forest Service. In addition to the plots in stands rated for damage, basic weather monitoring stations have been established in stands judged to be healthy or diseased in each of several climate zones. The weather data will be used to develop a better understanding of disease epidemiology by research cooperators at the U.S. Forest Service and University of New Hampshire.



Figure 4.—White pine affected by white pine needle disease (*Mycosphaerella dearnessii*) in Bethel, ME.

## Insect Highlights

Although most forest defoliators did not cause significant defoliation, public reports as well as aerial and ground surveys turned up several areas of red oak (*Quercus rubra*) defoliation by the native **bare-patched oak leafroller** (*Pseudexentera spoliata*) (figure 5). This is a tiny moth that flies early in the spring and lays its eggs on the buds of red oaks. The larvae hatch, initially feed on the buds, then roll the leaves from the tip down and feed inside the leafroll. They finish up feeding in June and drop to the ground to pupate and stay there until the following spring. It has only rarely been reported as a problem, but we had samples sent in from a moth flight in Cherryfield (Washington County) in April where there was some significant defoliation last year. Moderate defoliation was mapped in Kennebec, Oxford, and southern Franklin and Somerset Counties. The heaviest defoliation, and the largest area, was in Washington County. The total area defoliated across the State was 9,399 acres.



Figure 5.—Bare-patched oak leafroller (*Pseudexentera spoliata*) larva and leaf roll in Augusta, ME.



Two other native, early season defoliators of note included **Bruce spanworm** (*Operophtera bruceata*) and **fall cankerworm** (*Alsophila pometaria*). Light to moderate damage from Bruce spanworm was again found in T2 R8 NWP (Penobscot County) with another report from Alder Brook Township (Somerset County). Feeding was on sugar and red maples, birch, beech, and aspen. Aerial survey resulted in 624 acres of moderate defoliation mapped. Two hundred thirty-three acres of defoliation by fall cankerworm were mapped in the adjacent towns of Clinton (Kennebec County) and Burnham (Waldo County) in red oak-dominated forests.

Established populations of the invasive species **winter moth** (*Operophtera brumata*) were found in Maine for the first time in Harpswell (Cumberland County) and Vinalhaven (Knox County). A homeowner reported moths in the fall of 2011 in Harpswell (figure 6). Samples sent to UMass confirmed winter moth adults.



Figure 6.—Winter moth (*Operophtera brumata*) damage in Harpswell, ME.

Ground surveys in May 2012 found light to moderate feeding on a wide array of hardwood trees and shrubs with oaks, apple, and maple most heavily affected. Aerial survey mapped 606 acres of damage in Harpswell.

The news release about winter moth in Harpswell sparked a flurry of calls and e-mails from around the State, and the one from Vinalhaven proved to be another infestation. Ground surveys found winter moth within the “downtown” area of the island, and the infestation is about 100 acres in size.

Outreach events in both communities were very successful, and residents are working to limit the spread of winter moth to other areas. They are banding yard trees to help protect them from the winter moth (figure 7). They also offered property for long-term study plots, put up posters alerting people to winter moth’s presence in their towns, and stopped having landscape plant sales. Both towns have information on their Web sites and direct questions to the Maine Forest Service (MFS).



Figure 7.—Banding trees in Harpswell to monitor the winter moth population.

The Maine Forest Service and UMass are working on laying the groundwork to release the parasitic fly *Cyzenis albicans* in hopes of controlling the winter moth. The MFS and the University of Maine have applied for a U.S. Forest Service grant to study host susceptibility and winter moth range. The MFS and the U.S. Forest Service are establishing long-term study plots to monitor the spread and impact of winter moth in Maine.

**Browntail moth** (*Euproctis chrysorrhoea*) winter web counts were extremely high in Freeport (Cumberland County) going into the winter. The high browntail moth population, reduced feeding, and cold wet spring weather probably contributed to the ensuing *Entomophaga aulicae* outbreak that decimated the browntail moth population. Turner, Vassalboro, and Augusta (Kennebec County) and Falmouth and Cumberland (Cumberland County) have small browntail populations. Despite the population drop, the larvae still defoliated 1,141 acres in Cumberland and Androscoggin Counties (figure 8).



Figure 8.—Late instar browntail moth (*Euproctis chrysorrhoea*) larva on apple in Maine.

Field trials for the naturally-occurring browntail moth nucleopolyhedrovirus, EcNPV performed in 2011 in Bowdoinham (Sagadahoc County) and in September in Freeport were checked for long-term control of the browntail moth. There were no larvae in Bowdoinham. Larvae from Freeport showed signs of the virus but were overtaken by *E. aulicae*. We will continue monitoring these sites.

Although there were abundant reports of caterpillars of late-season defoliating species, defoliation that could be mapped never surfaced. We received more reports of the non-native **gypsy moth** (*Lymantria dispar*) this year than in previous years.

Defoliation was not mapped, and to date egg mass surveys do not indicate an increasing population. In addition, the **saddled prominent/green striped mapleworm/variable oakleaf caterpillar complex** (*Heterocampa guttivitta*, *Dryocampa rubicunda*, *Lochmaeus manteo*, and others) received notable attention from the public and forest managers in a wide, central belt across the State. However, no overstory defoliation that could be mapped was seen.

In 2012, the MFS coordinated a large-scale **emerald ash borer** (*Agrilus planipennis*) survey with purple panel traps. Approximately 960 traps were hung in ash trees (*Fraxinus* sp.) throughout the State (figure 9). Within the MFS, the Insect and Disease Lab partnered with the U.S. Forest Service Forest Protection and Forest Inventory and Analysis units. Additional partners were USDA Animal and Plant Health Inspection Service (APHIS), Maine Department of Agriculture, and the Penobscot Indian Nation. This was treated as a critical incident exercise and was a useful exercise in cooperating with several agencies.

All traps were negative for emerald ash borer.



Figure 9.—MFS Rangers working on the purple trap survey.



A network of volunteers from the Small Woodlot Owners Association of Maine, native tribes, and a State Park girdled ash trees on their property to serve as trap trees for emerald ash borer. Fourteen trees throughout the State were girdled in the spring of 2011. The trees were felled, and the boles peeled and examined for emerald ash borer galleries at two workshops hosted by the MFS in February 2012. Forty volunteers, including landowners, tribal members, and basketmakers, as well as individuals from the University of Maine and the Maine Department of Conservation, attended the workshops to learn about emerald ash borer and help peel ash bolts (figure 10). No sign of emerald ash borer was detected. In the spring of 2012, 10 additional volunteers girdled ash trees, which will be felled and peeled in early 2013.

Biosurveillance was carried out at 12 locations throughout Maine, including some new sites and sites that had not been monitored for 2 to 3 years. No emerald ash borers were collected.



Figure 10.—Volunteers learn about EAB and help peel bark from trap trees (February 2012).

**Hemlock woolly adelgid** (*Adelges tsugae*) benefited from the abnormally warm winter temperatures. Overwintering mortality of the adelgid averaged 17 percent across five forested sites in coastal Maine. At nearly all locations where this insect is established, there is enough new hemlock growth to support burgeoning adelgid populations. In 2012 forest infestations of hemlock woolly adelgid were detected in six additional towns, which brought the number of towns known to have forest infestations in Maine to 36. These towns stretch out along the southern third of the Maine coast, an area that is rich in hemlock and connected to an inland concentration of hemlock-dominated forest. In 2012, support from the USDA APHIS allowed the release of 10,000 *Sasajiscymnus tsugae* predatory beetles in two State Parks. Hemlock woolly adelgid threatens the aesthetics and ecology at both State parks (figure 11).



Figure 11.—Declining hemlocks affected by hemlock woolly adelgid at Wolfe Neck Woods State Park in Freeport, ME (March 2012).



We continued to have new detections of **elongate hemlock scale** (*Fiorinia externa*) on ornamental trees this year, perhaps due to increased public and green industry professionals' awareness of the pest. There were no new detections of this pest in the forest. The geographic area with known infestations greatly expanded, with detections this year in the area between Portland (Cumberland County) and Mount Desert (Hancock County). Detections on planted trees now stretch across half of the coast of Maine and are in areas with high concentrations of balsam fir (*Abies balsamea*), a native host of this pest. It appears that spread of this unregulated pest into our forests will be greatly accelerated by importation of infested planting stock.

**Spruce budworm** (*Choristoneura fumiferana*) catches in pheromone traps are generally the same as last year with some sites up and some down. There are still no reports of larval feeding in Maine. Highest trap catches are all in Aroostook County in the northwestern rooftop of the State plus a hot spot just north of Penobscot County. The five sites with no budworm are new locations—four in central Maine and one in the northeast. The overall average catch from 72 sites across the northern half of the State was 5.7 moths. The highest moth count was 40.0 moths (average of three traps) in T17 R12 WELS (Aroostook County).

The Quebec spruce budworm outbreak continues to expand with defoliation now south of the St. Lawrence Seaway. Larvae were reported from nearby Madawaska County, New Brunswick, but there was no defoliation; this area is adjacent to the higher trap counts in Maine. The MFS will continue to monitor this serious pest.

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## References

### Land Cover Map:

U.S. Geological Survey. 2011. 2006 National land cover dataset. Sioux Falls, SD.

### Forest Land Ownership, Forest Species Type:

U.S. Department of Agriculture, Forest Service. 2009. Forest resources of the United States, 2007. Gen. Tech. Rep. WO-78. Washington, DC. 336 p.



Forest Health Protection  
U.S. Forest Service  
Northeastern Area  
State and Private Forestry  
271 Mast Rd.  
Durham, NH 03824  
603-868-7708  
<http://www.na.fs.fed.us>



Maine Department of Agriculture  
Conservation and Forestry  
Maine Forest Service  
22 State House Station  
Augusta, ME 04333-0022  
207-287-4981  
[www.maineforestservice.gov](http://www.maineforestservice.gov)

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